[illegible]

"A STUDY IN THE CONTROL OF [illegible] IN [illegible]

BY

Kenneth F. Maxcy

1941.

"A STUDY IN THE [illegible] OF TYPHOID FEVER IN [illegible]"

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The decline in prevalence of typhoid fever in the rural areas of the United States is doubtless due to a multiplicity of causes whose relative values vary with the locality concerned. For convenience, these causes may be placed in two general groups,- one to include the general or natural forces operative throughout the country to a greater or less degree, and the other to include artificial causes operative locally and due to the efforts of public health authority. Some evidence of the existence of the former has been offered in the preceding study. The present study is concerned with the application of the latter to rural conditions.

With notable exceptions, current sanitary practice in the prevention of typhoid is a resultant of successive steps in knowledge of the way in which the disease is spread,- irrespective of the conditions under which the original observations were made. Thus the formula may be briefly stated as:

(1) Protection of water supplies
(2) Proper disposal of sewage.
(3) Protection of milk supplies.
(4) Anti-fly measures.
(5) Bed-side prophylaxis.
(6) Antityphoid vaccination.

There seems to be a general tendency to base action against typhoid along these lines in much the same way whether the area involved is a densely populated urban district or a thinly populated rural area.

It is assumed that the nature and conditions of transmission of the a disease are the same in both instances: to wit, that it is an epidemic disease due principally to polluted drinking water or milk; that when these two cannot be blamed flies are responsible; that a few cases are due to direct contact with persons sick with the disease. It is held furthermore that the same necessity exists in the country as in the city of attributing a given case to "polluted well-water", "dirty milk" or "fly-born infection".

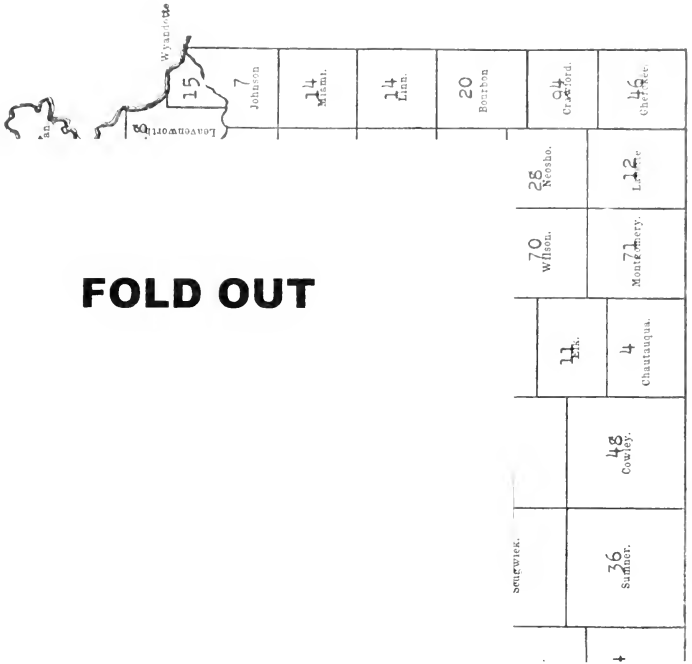
With this point of view the reduction of typhoid in rural areas has seemed to depend upon sanitary conditions i.e. the proper location and protection of wells, cleanliness in handling milk, sanitary privies, reduction of flies and similar measures. As a second line of defense recourse has been taken in many instances to wholesale vaccination of the community. Campaigns of this kind may be described as extensive in character. They have doubtless had their effect in reducing morbidity from typhoid in the rural districts.

In this paper it is desired to call attention to certain differences that exist between the conditions of transmission in the organized, densely populated urban community on the one hand, and the relatively unorganized, thinly populated farming district on the other. Evidence is presented to show that in the latter instance a more intensive method of control is practicable and may be more economic and effective. The data is derived from an analysis of the situation in Kansas,- a fairly representative state with a large rural population.

If the geographic distribution of cases in Kansas in any one year or succession of years is studied, one is impressed with the fact that the disease is more endemic in its character than epidemic. The annual toll is made up by a case here and one there, four or five cases in this county perhaps twenty or thirty in another, often occurring in groups of twos or threes in different neighborhoods at different times during the year. Occasionally a definite small epidemic of some fifteen or twenty cases occurs. The disease flourishes in summer and autumn, becomes quiescent in winter and spring, only to burst forth the following year,- reaching maximum at about the same time each year, varying slightly in the total number of cases and the localities of maximum incidence. If the deaths for a six year period (Graph) are plotted on the basis of population by counties, it is found that certain areas are prone to have a constantly high rate as compared with others,- a tendency toward focal distribution which is born out upon examination of the situation in individual counties. Year after year cases occur in certain communities in a county while others in the same county are relatively immune.

The seasonal distribution of deaths from typhoid fever in the rural areas of Kansas are shown in Graph . It will be noted that 87% of the deaths occur in the last six months of the year. The maximum is reached in September; minimum in February. During the five years on which this graph was based there were no epidemics of "winter typhoid". The curve is similar to that found in cities where the water supply is perfect or nearly so, and so far as it goes would imply that water must play an exceedingly small role in the dissemination of the disease in rural Kansas.

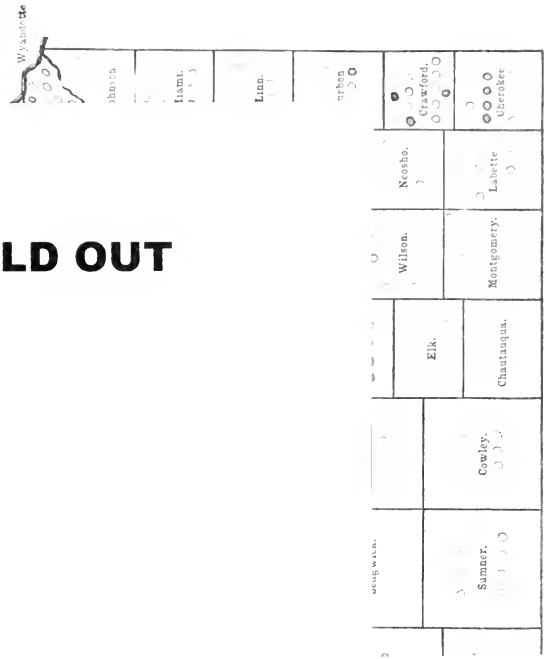
The following instances of the occurrence of typhoid in rural sections of the state are typical:



FOLD OUT

18. (Urban Areas excluded).

ph III-Seasonal Distribution of Typhoid Fever Cases in Rural Kansas, based on the 5-year period 1914-18.



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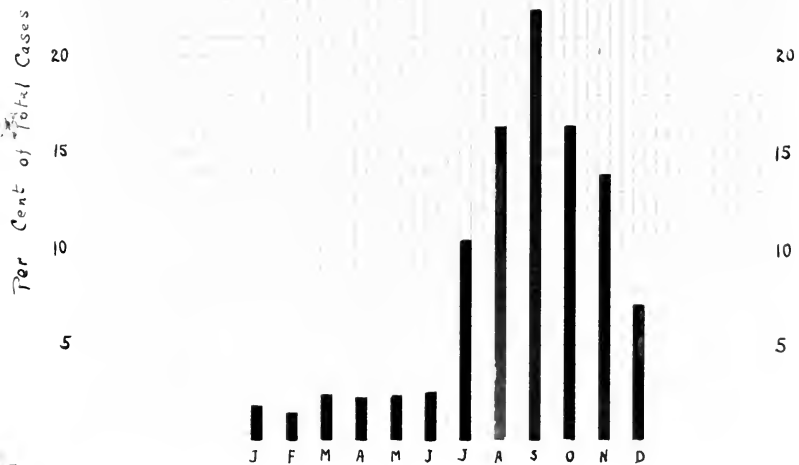
period 1914 1918 inc.
by counties

h III-Seasonal Distribution of Typhoid Fever Cases
in Rural Kansas, based on the 5-year period 1914-18.



ph III—Seasonal Distribution of Typhoid Fever Cases in Rural Kansas, based on the 5-year period 1914-18.

Small Epidemic of Typhoid Fever

Originating at a Church Social.

This epidemic occurred in a thinly populated farming district centering about the village of O. The village itself had possibly one hundred inhabitants. It consisted of two general stores, a lunch room, a hotel ?, a bank, church and school about which were grouped a cluster of houses. The church was without competition within several miles so that it attracted practically all of the people livingly inclined in the neighborhood. Most of the typhoid which had occurred in this county in the past 25 years had been reported from this general section. There had been no serious outbreaks in the past five years, but two or three cases occurred in and about the village of O. each year.) Previous to the outbreak to be described there had been no known cases in this part of the county for a year or more.)

On July 30th, L.H. a girl working in the lunch room in the village of O. became ill and her physician strongly suspecting typhoid fever advised her immediate removal to her home in [illegible] town. In the next few days this case was quickly followed by others, here and there on this farm and that, in the country surrounding. [illegible] nineteen were found ill with the clinical symptoms of typhoid. Sixteen of the nineteen fixed their onset between July 30th and Aug. 10th.

Laboratory examinations were made [illegible] in several cases. Forms from [illegible] typhoid bacilli were found [illegible] Widal reaction [illegible] pathological reaction.*

(Foot Note)

* The technique for the detection of the typhoid bacillus in stools was that generally adopted. A small bit of fecal material - preferably from a fluid stool after the use of a cathartic - was collected in a 1 oz. bottle containing about 15 cc of a solution consisting of Normal salt sol. 80 pts. and glycerine 20 pts. This was transported to the laboratory and without unnecessary delay plated out on Endo's. At the end of 24-48 hrs., suspicious colonies were pickedd off and inoculated upon Russel's media (triple sugar with Andrade indicator). If the reaction was typical of B.typhosus, the slant was examined for purity, morphology, staining reactions, and motility. If a pure culture of a gram negative motile bacillus was found , the growth was taken up in suspension in salt solution. This was then tested for its agglutinability with a known antityphoid serum. The antityphoid serum upon which chief reliance was placed was a horse serum with a very high titre(1/40,000)obtained from Dr. Bull. All of the strains obtained from carriers were subsequently sent to Dr. N.P.Sherwood, Professor of Bacteriology, at the University of Kansas, for confirmation.

[illegible] of infection [illegible] assumed [illegible] the disease to be [illegible] fourteen days and having determined the modal date of onset for the first case on record to be August 7th, the date of the infection was placed tentatively at some [illegible] about July 20th. The fact that the three remaining cases developed after August 15th was held to be not inconsistent with this hypothesis inasmuch as incubation periods as long as five or six weeks are known to be not uncommon.

The Vehicle of Transmission.

There being no common water or milk supply, it seemed that the vehicle of transmission must be some article of food or drink consumed by these nineteen persons on some special occasion about the date mentioned. There had been three community gatherings in the month of July,- a picnic on July 5th, and ice cream socials at the church on July 16th and 30th. Suspicion naturally attached to the gathering on the 16th, and questioning brought out the fact that all of the persons ill had attended this function and all had eaten ice cream. Since this was the only article of food served and many of those ill denied drinking any water while at the social, it seemed clear that it must be the vehicle of transmission.

The possibility that the co[illegible] used in [illegible] through which the infection was distributed was considered. This seemed particularly [illegible] when it was found that [illegible] had carefully been rinsed in cold water before being used [illegible]. If the person to whom the duty of washing dishes [illegible]

[illegible] an earlier conceivably [illegible] of transmission. [illegible] inquiry [illegible]

Mrs. F. had her entire [illegible] ish weekly. [illegible]

was carefully [illegible]

This possibility was therefore disregarded as unlikely, the [illegible]

assumed to be in the ice cream itself, and a search for [illegible]

[illegible] was undertaken.

The Source.

In investigating the source of contamination [illegible], attention was first directed to the conditions under which the ice cream had been made. The ladies to whom the treat was [illegible] had gathered at the parsonage on the afternoon preceding the social. With them they had brought the milk cream and eggs donated by various farms in the surrounding [illegible]. Mrs. C.P. had portioned out the milk; B.P. and F.H. had added the necessary quantities of sugar, eggs and flavoring [illegible]. Contrary to the usual custom the mix was not cooked because it was a very hot day and the wife of the preacher, [illegible] ill in bed [illegible] would have been more [illegible]

[illegible] The mix was divided into several freezers [illegible]

[illegible] around.

Several leads for further investigation were suggested by this story:- [illegible] the ladies who mixed the ice cream, the illness [illegible] wife [illegible] the [illegible].

[illegible] . I [illegible]
[illegible] and was [illegible]
The farm from [illegible] was [illegible] are
was no history [illegible] with it.
[illegible] of the ladies [illegible] had [illegible] the [illegible] and [illegible]
similar manner. On the other [illegible] the illness [illegible] manikin's
[illegible] appeared at first to be a significant fact. Upon careful
inquiry however, it was found that her illness had been exceedingly
mild and had [illegible] of vague abdominal discomfort, urticarial
eruption and practically no fever at any time. The possibility of
an atypical mild attack was ruled out by a completely negative
widal reaction and stool culture.

The investigation now resolved itself into a search for the source of contamination of the milk. That the infection had come through this vehicle was made eminently possible by the fact the ice cream mix had not been cooked and by the fact that it has been demonstrated that freezing milk with a dasher ice cream freezer does not kill typhoid organisms.

The milk and cream had been donated by two different firms. [illegible] furnished approximately three quarts of milk and one quart of cream. It had all been mixed together in one large kettle so that if any one [illegible] had been contaminated it would have been distributed throughout the mix. Inasmuch as it was an exceedingly hot day the rapid multiplication of bacteria was [illegible]

Each of the [illegible] farms was visited. All the [illegible] living or working [illegible] listed. [illegible] to whether the [illegible] previously had typhoid or not; [illegible] there were any sick [illegible] typhoid; [illegible] typhoid vaccination, who did the milking, [illegible] it was kept clean, general sanitary arrangements, etc.

On five of the ten farms there were cases of typhoid resulting from the ice cream social. In the absence of other significant history it was considered relatively unlikely that a carrier was located on one of these farms, else these persons ~~xxxxxxxxxxxx~~, having been non-immunes, would [illegible] have been infected previously. Farm [illegible] was excluded since although two of the old folks had had the fever in 1930, there had been no cases since in a large household. On farm [illegible] 10 there was an absolutely negative history of typhoid and moreover the milk from this particular farm had been heated before it was sent to the church. This farm [illegible] the church [illegible] farm [illegible] folks, each other and [illegible] became to have been interrelated.

On farm [illegible] the farmer himself, Mr. U., had had typhoid in 1916. [illegible] children, J.U. and B.U., had had it in 1918. Neither [illegible] had [illegible] it. Stool cultures [illegible] J.U. and B.U. were negative.

On farm [illegible] the [illegible] children. [illegible] was G.U. [illegible] typhoid in 1912. U.U. himself [illegible] milk [illegible] this stool culture [illegible] was negative.

There remained only [illegible] first as not such [illegible] occurred on it, so far as was known. [illegible] reason [illegible] obvious. On it there were living at this time Mr. A.H.D. [illegible] They gave an interesting history. In the year 1[illegible], when this family had been living in a small town in Missouri, Mrs. A.H.D. had become ill with a severe case of typhoid, lasting three months or more. Following her illness, Mr. A.H.D. had had the disease and after him five of their children. The following year three more of their children and several of their neighbors' children had had typhoid following a party given at their house. Only one of their own children of a family of ten had escaped. They moved to their present location near the village of O. in Kansas in 1905.

In the face of such a suggestive history, suspicion was naturally focused on the three living on this farm. The specimens of stool obtained from the two men were negative; that from Mrs. A.H.D., the mother of the family, was positive for B.typhosus. Evidently she was the carrier.- the source of contamination of the milk. Although the son has done the milking, she has been responsible for preparing the milk in a proper container for transportation to the [illegible] on the day of the social. This milk, probably contaminated, if [illegible], mixed with that from the other farms without being cooled, churned until [illegible] in the form of butter has been responsible for the epidemic which [illegible] [illegible] cent [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible] disease [illegible] years previously. [illegible] following [illegible] children. [illegible]

[illegible] interest [illegible] modified [illegible]

[illegible] during [illegible]

[illegible] living in [illegible] of O. [illegible]

[illegible] Arthur [illegible]

[illegible] was doubtless responsible [illegible] of the "epidemic"

[illegible] occurred in this area. That [illegible]

it is impossible to estimate. Dr. J. [illegible] Loy, [illegible]

fourteen of the [illegible] cases occurring in this epidemic

estimated that the medical and nursing care alone for these

persons amounted to some $1,7[illegible]. Add to this the money cost

for "extra clothes", the lost wage earners, the [illegible] and the

financial efficiency of adequate sewage protection in rural areas.

The cost of such protection is approximately $2 per capita

per year. The cost of this epidemic alone was partially $20 per capita.

Comment: We spent much time on the cholera epidemic first attack. This epidemic by serving the well water from the parsonage and several of the other farm families. Most of these shallow somewhat [illegible] but a few color bacilli were [illegible] at the State Water and Sewage Laboratory with a [illegible] in transit. These wells were [illegible]. The investigation would doubtless have ended here and not the State supplied the money [illegible] to continue it.

In the "sporadic" cases that were occurring in the town had we systematically have traced, this "carrier" would doubtless have been detected previously and this disastrous epidemic prevented.

Name	Age	Onset	Incubation	Duration	Cultures	Blood*	Widal	Widal
[illegible]	1	July 10	[illegible] 1	[illegible]	[illegible] days			----
[illegible]	[illegible]	[illegible] 1	"	[illegible]	16 "		[illegible]	----
[illegible]	7	" 1	"	3	16 "		[illegible]	----
[illegible]	14	" 1	"	4	16 "		Negative	----
[illegible]	34	" 1	"	5	16 "		B.typhosus	----
[illegible]	40	" 1	"	6	16 "		Negative	Positive
[illegible]	7	" 1	"	3	16 "		Negative	---
[illegible]	[illegible]	"	"	4	17 "		--	---
[illegible]	30	" [illegible]	"	5	17 "		B.typhosus	Positive
[illegible]	17	" [illegible]	"	5	17 "		Negative	Positive
[illegible]	27	" 3	"	5	18 "		Negative	------
[illegible]	6	" 3	"	5	18 "		Negative	------
[illegible]	34	" [illegible]	"	10	20 "		-----	------
[illegible]	45	" 5	"	18	20 "		----	------
[illegible]	7	" 6	"	9	21 "		----	------
[illegible]	4	" 9	"	10	37 "		----	-------
[illegible]	20	" 15	"	30	30 "		Negative	-------
[illegible]	16	" 15	"	23	30 "		B.typhosus	-----
[illegible]	40	" 21	"	[illegible]	37 "		-----	-----

*Incubation period calculated as time elapsed between exposure and onset of illness.

TABLE [illegible] Showing [illegible] onset, incubation [illegible] and laboratory findings.

Small [illegible]

[illegible] Iowa.

The town of C.C. [illegible] population [illegible] is a municipal water supply [illegible] quality [illegible] from deep wells. A large proportion of the inhabitants [illegible] private wells. There is no common system of sewage disposal. Some houses are provided with septic tanks, but a majority [illegible] the ordinary type of dry privy. In general the town is [illegible] and the premises well kept. In 19[illegible] there had been a severe outbreak of typhoid, but since that time only sporadic cases, one or two per year, had occurred. The last previous case had been reported during the fall of the previous year from a farm about two miles outside the town.)

During August and September there occurred eight cases of typhoid in the town of C.C. The first case, a little girl aged six, had become ill about August 4th and had run a typical course of the disease. The source of her infection could not be ascertained. The next two cases (#2 and #3) contracted their infection from the first by direct contact. There was a definite history that these two little boys had visited and played with the little girl on August 14th, while she was sick in bed. They came down [illegible] fifteen to eighteen days later.

There was the death of the little girl (#1). She had been only on a convalescent diet [illegible] August [illegible].

[illegible] 4th, [illegible] th[illegible] [illegible] mild attack. [illegible] [illegible] 102.5°. [illegible] with "[illegible]" [illegible] onset. Although [illegible] was diagnosed [illegible], he and his wife [illegible] to believe it to be [illegible]. After [illegible] two weeks in bed, he was able to get up and a few days later resume his work as clerk in a grocery store in the town.

So far the source of the infection was fairly obvious, with the exception of the first case. But now there were four cases in a row in widely separated parts of the town with no apparent relationship to each other or to the preceding cases. A mother and her daughter-in-law came down on September 13th and 14th, respectively, evidently infected at the same time. In another part of the town a little girl aged nine years came down with the disease on September 13th, and finally, Case [illegible], a little girl aged eleven, went to bed with typhoid on September 23rd.

These cases could not be accounted for on the [illegible] of contact. There was no common water or milk supply; no common eating place. One was forced to the conclusion that the infection had been distributed, by indirect contact, by flies, or by raw fruits or vegetables. Proceeding on the last hypothesis it was found that all four bought their fruit and raw vegetables at the same store-"P's". [illegible] from which they [illegible] [illegible] "P" led to the discovery that [illegible] [illegible]

[illegible]

line [illegible].

[illegible]

might well have [illegible] - [illegible] in [illegible] incubation period [illegible] varies [illegible] to six days. [illegible], in [illegible] father of the first case, returning home on August [illegible], contaminated his [illegible] on the following day, his own incubation period was seven days (large dose), and by the same [illegible] became ill on the 12th day, [illegible] on 16th day, [illegible] on the 17th day, [illegible] on the 25th day.

[illegible] interviewed on September 30th, this man although [illegible] be working in the store over a week, was obviously still convalescent. Stool cultures made from him on [illegible] occasions thereafter showed large numbers of typhoid bacilli.

Comment: Proper isolation of the first case would have prevented this sequence of seven more.
A local physician deputised [illegible] Health Officer without the services of a visiting nurse or of expert consultation was ineffective in [illegible] this.
The role of contact and the carelessness with regard to a food handler are particularly noteworthy.

TABLE [illegible] Small Town (S.T.) Outbreak.

Case No.	Age	Date of Onset First symptoms	To Bed	Water Supply	Milk Supply	New fruits [illegible]	[illegible]
1	[illegible]	---	Aug. 4	Private well	Chowman	Pickerell	---
2.	[illegible]	Sept. 1	Sept.6	"	Plange	"	Aug.14
3.	7	Sept. 3	Sept.6	"	"	"	1 Aug.14
4.	37	Sept. 5	Sept.9	"	Chowman	"	1 Aug.29
5.	37	Sept. 5	Sept.10	"	Sedgewick	"	4 Aug.29?
6.	5[illegible]	Sept. 7	Sept.14	"	"	"	4 Aug.29?
7.	[illegible]	Sept. 7	Sept.13	City	Chowman	"	4 Aug.29?
8.	11	Sept.20	Sept.23	City	Small	"	4 Aug.27?

A "[illegible] FA[illegible]"

[illegible] threshing crew [illegible] on [illegible] at the Smith farm from July 2[illegible] to July 30th. Two weeks later Worth's youngest daughter, Ruth, aged 12, and his son Roy, aged 21 become ill. They were quickly followed by Clarence Worth and three other members of the threshing crew. The clinical symptoms of all were typical of typhoid.

The incubation period suggested that all had been infected at the same time and that the source of the infection was the Smith farm. This hypothesis was strengthened by two other facts. First, the daughter Ruth had helped at the Smith farm but had not assisted at the farms on which the threshing crew had previously and subsequently worked. Secondly, an outbreak of typhoid had been traced to this same farm four years previously.

The Smith farm was visited and a history of the family obtained. It is summarized in Table [illegible] It will be noted that the mother of the family had had "intermittent fever" in 1[illegible]96. About the same time her son Roy, [illegible] "typhoid fever". No more cases could be traced until 1910. In that year, Roy married and settled on a farm near the old homestead. He and his wife frequently had their [illegible] with the [illegible]. Six months after their marriage, Roy's wife died typhoid. [illegible] at the time.

A lapse of six years [illegible] without [illegible]. In 1916 Mr. Smith, the father [illegible], died with a brief illness and the family [illegible] John Cooley, a man who had been brought in to [illegible] during the emergency, became ill with typhoid fever [illegible] after his advent. Soon after, Mary Smith's three [illegible] Lillian, Ruth, and six year four, who were [illegible] of their age at the place, had been ill [illegible]. They were [illegible] by Letha Smith, who [illegible] of their [illegible]. Mrs. Merve Smith, a daughter-in-law, next became ill with the disease and died after a brief illness. Mrs. Troutmann, a neighbor who came in to help take care of the children was the next victim, and she subsequently gave rise to two contact cases, one of which gave rise to two more. This ended the chain in 1916,- a total of ten cases due to original infection and contact.

An investigation of the Smith farm was made by the health authorities at this time. A sample of water from the well was examined bacteriologically and announced unsafe. This was the only [illegible] considered to be the source of the infection. The well was dug and the [illegible] properly [illegible] with a [illegible] [illegible] the [illegible].

[illegible] worth the [illegible] [illegible].

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Mrs. [illegible]

[illegible]

[illegible]

Table [illegible]

Comment: Most of the cases [illegible] outbreak could have been prevented [illegible] an appreciation of the contagiousness of the disease, by proper nursing care and by protecting the persons in contact through removal to another home or by vaccination.
"Passing the buck" to the well water is typical. Had the "carrier" been detected in 1916, the 1917 outbreak might have been prevented..

[illegible]

[illegible] of [illegible]

the Brown farm [illegible] miles [illegible]

There [illegible] previous [illegible]

year. [illegible] examination of the well water was [illegible] ed [illegible]

instead [illegible] epidemiological investigation [illegible]

elicit [illegible] following data:

The Brown family consisted of Mr. Brown [illegible]

daughter Hazel, aged six [illegible] a baby, Harriet, [illegible]

one half months. The two helpers on the farm, [illegible] Howard,

[illegible] Sheffstall had been employed on the place over a year.

Case 1 - Hazel Brown, aged 6, became ill on July 2 th

and went to bed on August 1st. At the time of the investigation

she was in the third week of the disease and presented a typical

clinical picture of typhoid.

Case 2 - Howard Sanford, aged nineteen living on the next

farm in a farmhouse a half mile northeast of the Brown residence,

began to feel badly about August 1st and went to bed on August 7th.

Case 3 - Amy Sheffstall, aged twenty-six, living in the

town of W.C., had been employed at the Brown farm between July 4th

and 17th to attend Mrs. Brown at the time of her confinement.

About August 9th she began to have fever and on August 14th went

to bed with a typical case of typhoid.

Case 4 - Mr. Brown had become ill on August 14th and had

immediately gone to a hospital in a nearby town for treatment.

He was said to have typhoid.

A [illegible] pointed fairly [illegible] on July [illegible]th and 17th [illegible] outside the Brown household [illegible] helpers on the farm both of which were young [illegible] history of a previous attack of typhoid. This left only Mrs. [illegible] to be considered. She gave a very definite history of typhoid two years previous. She had had a very severe attack and had never felt well since, complaining of vague abdominal symptoms. A stool culture from Mrs. Brown was positive for B. typhosus.

Evidently then Mrs. Brown was the "carrier" responsible for the outbreak. Her husband and daughter Hazel had been vaccinated against typhoid at the time of her illness two years previous. This had protected them up to the time that she gave birth to her child in July. With the spilling incident upon the delivery, they were probably subjected to overwhelming dosage and succumbed. This partial immunity may account for Mr. Brown's long incubation period, or he may have been a secondary contact with Hazel. The nurse, who was obviously exposed to the greatest degree, began to feel badly before she left the Brown farm on July 17th although she did not "give up" and go to bed until August 14th.

Case 2 on the Dairy Farm could not be accounted for on the basis of air or direct. It is possibly an instance of fly- or [illegible] infection. Sanitary conditions did not [illegible].

Comment: [illegible] the family after they [illegible]. Fly-borne infection might be [illegible] the house.

[illegible]

In 1,22 [illegible] St. George. [illegible] previous [illegible] In 1917, [illegible] "H" family, [illegible] typical [illegible] shortly [illegible] during these three years. [illegible]

The "H" family [illegible] this neighborhood. [illegible] Neither the father nor the mother [illegible] in the family had been sick with an illness [illegible] so far as could be ascertained. No history [illegible] obtained in relatives, visitors, or neighbors, [illegible] above - Mr. Light.

Both Mr. Light and the "H" family [illegible] well [illegible] "w" on the diagram. This was [illegible] the infection. It was a dug well with tile casing [illegible] protected top. From its location the [illegible] possibility [illegible] It was situated [illegible] spring marked "p" on [illegible] diagram [illegible] It was [illegible] "spring p". [illegible] [illegible] Inquiry [illegible] to this neighborhood [illegible] family.

TREASURY DEPARTMENT

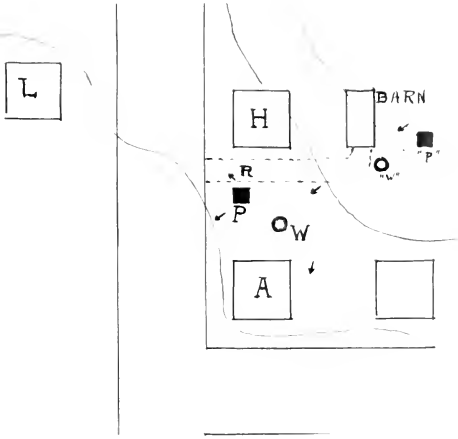
UNITED STATES PUBLIC HEALTH SERVICE

COOPERATING WITH THE

KANSAS STATE BOARD OF HEALTH

PUBLIC HEALTH LABORATORY

TOPEKA, KANSAS



[illegible]

[illegible] Mr. [illegible] [illegible]

[illegible]

[illegible] following: [illegible] Mr. [illegible] [illegible] a clerk in [illegible] stores in town. [illegible] contact and may have picked up his infection. [illegible] to the old [illegible] privy "B". From this infection reached by [illegible] direct [illegible], through [illegible] or possibly by flies.

Comment: [illegible] to the source of the [illegible] unsanitary privy. [illegible] privy was used by a chronic carrier of [illegible] [illegible] source; on an isolated [illegible] [illegible]

[illegible]

[illegible]

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1. Klinger [illegible]

2. Leblanc [illegible] "The Ontario Fever Carrier" [illegible] 10 [illegible], appendix [illegible] pp.247-265.

3. Chesley [illegible] - "Three Years' [illegible] in [illegible]". [illegible] 1917 [illegible] pp. 1102-[illegible]

4. Wendt, F.M. - Unpublished

5. Vernon R.B. - Unpublished

[illegible] in character [illegible] distribution. [illegible] distribution - [illegible] comparative.. [illegible] "[illegible]," "[illegible]" or "[illegible]" [illegible]

[illegible] "[illegible]" by [illegible] contact [illegible] - [illegible] [illegible] Indeed quite [illegible] [illegible]

[illegible] well.

[illegible] "resistant" [illegible] definitely. [illegible] attitude [illegible] "[illegible]tion" depends upon the size of the reservoir, [illegible] of the [illegible], [illegible] of [illegible] personal cleanliness existent. The carrier [illegible] the [illegible]; sanitary surroundings and contact continue it.

[illegible] Sir William Budd pointed out as far back as 1874, " For the [illegible] of this fever [illegible] specific element is [illegible] than [illegible] the dungheaps or the privies were in the [illegible] course of things able to furnish. In the course of time, the element was [illegible], and it was then found that conditions which had been without power to generate fever, had but too great power in propagating it's spread when once the germ of the fever had been introduced". Without negletting the "swine, the dunghe[illegible], or the privies", and [illegible] well and flies and well-water which have been [illegible] of [illegible] infectious, it is [illegible] [illegible] a majority of [illegible] "source" [illegible] is "a specific element" - whether it [illegible] [illegible] economic [illegible] [illegible] [illegible] possible.

In [illegible] city, one [illegible] alti[illegible] [illegible] ts, i[illegible] [illegible] e [illegible] tence infecting to its [illegible] source. It has [illegible] been necessary to prevent dissemination by flooding the usual routes of transmission, [illegible] was practically feasible. Attention has been focused [illegible] water, [illegible], milk-supply, raw-foods, and flies [illegible] upon reported [illegible] rather than upon tracing down unreported cases and carriers. In the rural districts, on the other hand, the situation is simplified.

The extracorporeal life of the typhoid bacillus is comparatively short*. The vast majority of organisms die

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* In crude sewage, 12 days (Firth); in a septic tank, 14 days (Pickard); in butter, [illegible] (Salley and Field); in home-made cheese, [illegible] days [illegible]); in cot-cheese, [illegible] days (Lenke); in ice cream, 39 days (Mitchell), etc.

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within twenty-four hours after excretion. When a case of typhoid fever occurs under our [illegible] conditions chance is greatly in favor of the infecting organisms having left their for[illegible] human host on the same day on which infection occurred. This date may be approximately set by counting back [illegible] days (one to six weeks are the outside limits) from the date of onset of the infected individual. If an investigation is undertaken within a reasonable time after the onset (two to three weeks) the events which transpired about the time of infection are well within the scope of recent memory and a fairly accurate account may be obtained.

The farm is [illegible] a unity in itself. People living upon it frequently [illegible] days, even weeks, without intimate contact with individuals on an [illegible] village. Intimate [illegible]

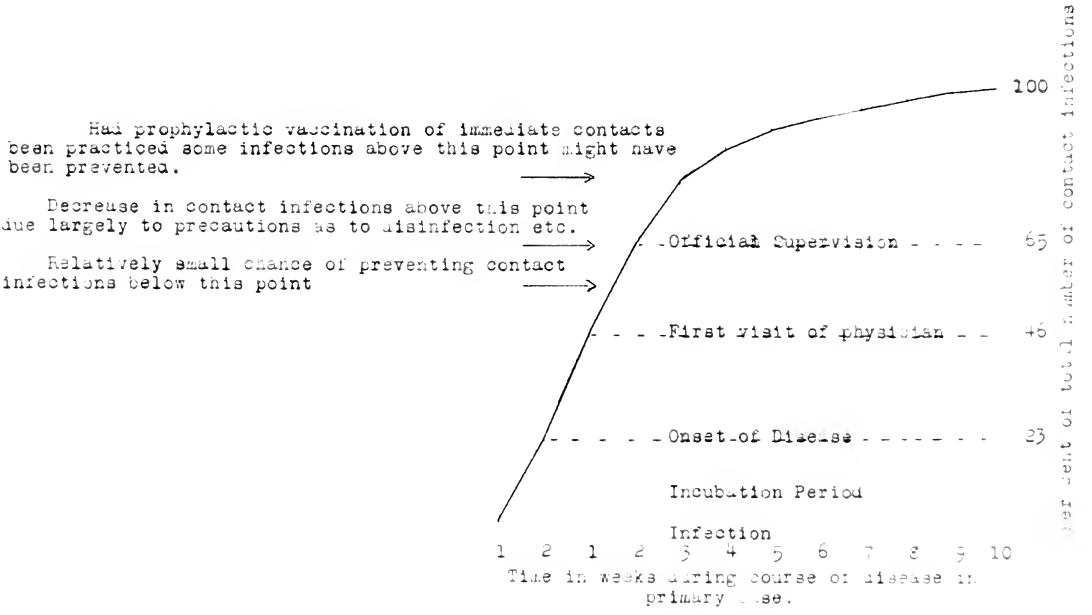
However, the history of [illegible] family in [illegible] typhoid is usually readily [illegible].

[illegible] hidden transmission [illegible] only [illegible] attention. In those (rare) cases in which politics [illegible] is responsible, the human source of this infection must [illegible] or deposited excrement on the ground near the well within a relatively short time. Prime interest may be centered in the persons who might have done this; their number is small and may be ascertained with great accuracy. If milk or other food is the vehicle, then the person who contaminated it must have assisted in its preparation on that farm on the day on which infection occurred. Again the possibilities are limited. If the fly has acted as intermediary, as may be the case in certain (rare) instances, he has brought his gifts probably from a nearby neighbor, and previous history of typhoid in the neighborhood may point out the direction quite clearly. Experience in rural districts however, emphasizes again and again, the importance of the "human-hand → food" route in the transmission of the disease as contrasted with water and milk as the vehicles in urban districts.

The correlation of the data obtained concerning personal contacts at or about the time the infection occurred (within fourteen days before the onset of the modal point) particularly with reference to the preparation of food, with the data obtained regarding previous history of typhoid in these individuals and in the neighborhood, usually leads to a definite [illegible] to the most probable source or more than the most [illegible] "[illegible]". [illegible] seems to [illegible] [illegible] (to [illegible]) [illegible] establish [illegible].

[illegible]

of the disease in the primary case - assuming the incubation period to be fourteen days - based upon 812 cases reported by Klinger.



[illegible]

[illegible]

[illegible] ,xxx [illegible]

[illegible] than simply answer "call" alarm.

[illegible] "[illegible]" [illegible] - [illegible] - [illegible] [illegible] illiteracy [illegible] investigations [illegible] will [illegible] concentrated.

[illegible] control, in the order of [illegible] importance, [illegible] levels:

1. [illegible] cases [illegible]
   a. Unrecognized cases
   b. Unrecognized carriers.

2. [illegible] cases [illegible]
   a. Recognized cases.
   b. Recognized carriers.

3. [illegible]
   a. Personal [illegible]
   b. Family [illegible]
   c. Community [illegible].

First responsibility for the [illegible] level [illegible] city. It should be provided, however, that [illegible] the local authority is unable to prevent the [illegible] [illegible] shall be [illegible] to be effectively [illegible] control [illegible]. The latter, [illegible], should be used [illegible] to furnish [illegible] available [illegible] investigation.

Common [illegible] [illegible] daily [illegible] the [illegible]. [illegible] Public [illegible] facilities. [illegible] provided [illegible] extension [illegible] no extra burden [illegible] upon [illegible] service with its [illegible] sub-laboratories [illegible] co-operation [illegible].

The carriers [illegible] in routine laboratory examinations [illegible] be classified [illegible] temporary or permanent. The latter [illegible] enrolled in a [illegible] register [illegible] followed up from [illegible]. To this register will [illegible] the names of those carriers [illegible] in epidemiological investigations. Local health officers should be kept fully posted concerning carriers in their jurisdiction. They should visit them at least two or three times per year ([illegible] during the "typhoid season") xxx, encourage them to [illegible] precautions and see that they keep out of food industries - particularly the production of dairy products for sale.

In general [illegible], legal restraint of a carrier is seldom necessary. This condition [illegible] becomes [illegible] over time, it is only [illegible] A "[illegible]" may [illegible] thoroughly isolated [illegible].

[illegible] fairly [illegible]

> "Still [illegible] slow[illegible] of [illegible] typh[illegible] but [illegible] probably, [illegible] pla[illegible] defe[illegible] this [illegible] Dr. Kem[illegible] health officer, [illegible] it. Dr. [illegible] the [illegible]."

It illustrates [illegible] points: [illegible] in the origin [illegible] from a w[illegible] what [illegible] which still exists; the health officer with [illegible] mind about "water- and" [illegible] and indiscriminati[illegible] well-water; and lastly, the convales[illegible] probably still [illegible] typhoid bacilli circulatin[illegible].

If this [illegible] is a fair [illegible] control of typhoid [illegible] in rural areas [illegible] conclusion that the [illegible] previously) and not [illegible] local causes [illegible] complete bedside disinfection which is [illegible] instruction [illegible] of rural typhoid.